

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
18 April 2002 (18.04.2002)

PCT

(10) International Publication Number  
**WO 02/31413 A2**

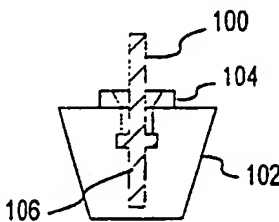
- (51) International Patent Classification<sup>7</sup>: F24F 6/00, 6/08 (74) Agent: BOYD, Damon, L.; Snell & Wilmer L.L.P., One Arizona Center, 400 East Van Buren, Phoenix, AZ 85004 (US).
- (21) International Application Number: PCT/US01/31461
- (22) International Filing Date: 9 October 2001 (09.10.2001) (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
60/239,621 9 October 2000 (09.10.2000) US
- (71) Applicant (*for all designated States except US*): THE DIAL CORPORATION [US/US]; 15501 North Dial Boulevard, Scottsdale, AZ 85260 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (*for US only*): HE, Mengtao, Pete [US/US]; 10814 East Palm Ridge Drive, Scottsdale, AZ 85259 (US). TRIPLETT, Carl [US/US]; 9202 East Pershing Avenue, Scottsdale, AZ 85260 (US). WOLPERT, Christopher, J. [US/US]; 6411 East Jean Drive, Scottsdale, AZ 85254 (US). STATHAKIS, Kristopher, J. [US/US]; 11642 North 91st Way, Scottsdale, AZ 85260 (US). PARK, Debra [US/US]; 2916 E. Lockwood Street, Mesa, AZ 85213 (US).
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD AND APPARATUS FOR FASTENING A FLUID TRANSPORT MECHANISM TO A CONTAINER



(57) Abstract: The present invention relates generally to the fastening of a fluid transport mechanism to a fluid reservoir, and optionally, to various mechanisms which increase the effectiveness of the vaporizing units within which such devices may be employed. For example, the fluid transport mechanism is suitably fastened to the reservoir and removal of the transport mechanism is substantially inhibited by a retaining force provided by one or more fastening features. That is, the transport mechanism is fabricated or suitably augmented such that once it has been inserted into the reservoir, it is not easily removable without significant force or through the use of tools. The retaining force is a force which opposes other forces applied to the transport mechanism which would tend to remove the fluid transport mechanism. For example, the retaining force is provided, at least in part, by fastening features configured on the fluid transport mechanism and/or other components, such as a fitment or a sleeve, which engages the transport mechanism and likewise inhibits its removal by directing the retaining force in a direction opposite to that which is needed to remove the transport mechanism from the reservoir. Thus, the fastening elements may suitably comprise various configurations of the transport mechanism itself, components attached to or part of the reservoir, or various combinations of the foregoing, all of which provide an effective retaining force which aids in inhibiting removal of the transport mechanism.

WO 02/31413 A2

## METHOD AND APPARATUS FOR FASTENING A FLUID TRANSPORT MECHANISM TO A CONTAINER

Inventors: Mengtao Pete He; Carl Triplett; Christopher J. Wolpert; Kristopher J. Stathakis;  
Debra Park

### FIELD OF THE INVENTION

This invention generally relates to the inhibiting the removal of a fluid transport mechanism from a fluid reservoir of a liquid vaporizing unit, and more particularly, to various fastening elements for inhibiting the removal of the fluid transport mechanism to the fluid reservoir of the unit.

### BACKGROUND OF THE INVENTION

There have been various methods and apparatus devised to attempt to regulate the diffusion of volatile materials especially with regard to the vapor delivery of fragrances and/or deodorizers. Exemplary prior art devices that relate to such methods and apparatus are U.S. Patent Nos.: 525,646; 1,123,036; 1,129,897; 1,323,659; 1,377,909; 2,383,960; 2,507,889; 2,616,759; 2,657,090; 2,787,496; 2,797,844; 2,878,060; 2,961,167; 2,975,464; 3,104,816; 3,239,145; 3,550,853; 3,633,881; 3,679,133; 3,804,331; 4,014,501; 4,094,639; 4,413,779; 4,663,315; 4,739,928; 5,038,394; 5,647,053; 5,903,710; 5,945,094; 5,976,503; and 6,104,867. The primary function of these types of devices has generally been the counteracting of malodors as well as the delivery of aesthetically pleasing fragrance vapors.

Liquid air fresheners and other vapor-dispensing products currently on the market typically have a fragrance liquid reservoir and a transport system from which fragrance is evaporated and/or dispensed into the surrounding air. One approach to dispensing fragrance has been to drip the fragrance liquid from the reservoir onto a porous substrate of relatively large surface area where the fragrance is evaporated from the substrate surface. Another method has been to partially immerse a wick made of porous material in a liquid fragrance-reservoir where the liquid is transported through the wick by capillary action. The fragrance is then evaporated from the exposed wick surface into the surrounding air.

If the space proximal to the wick is heated by an electrical heating element, the fragrance delivery device is often referred to as an electric liquid air freshener. In such devices, the heating element delivers kinetic energy to molecules of the fragrance solution on the exterior surface of the wick, thereby increasing the rate of evaporation to obtain higher fragrance intensity and uniform delivery density over time.

Products currently on the market have utilized wicks constructed of compressed graphite, porous ceramic, or fibrous bundles. See, for example, U.S. Patent No. 4,663,315 issued May 5, 1987 to Hasegawa et al., and U.S. Patent No. 4,739,928 issued Apr. 26, 1988 to O'Neil. In such cases, the transport mechanism is capillary action of liquid passing  
5 through a winding path within the structure of the wick.

Some advantageous design characteristics for liquid dispensers are: (1) their ability to effectively retain their liquid transport mechanisms (e.g., wick) in proper orientation and alignment in the liquid reservoir with sufficient retention force to keep the wick from being easily removable; (2) their ability to provide a tight seal to prevent leakage from around the  
10 wick, under the fitment, and under any cap; (3) their ability to maintain proper alignment and positioning of the wick relative to a heating element; (4) their ability to provide sufficient surface area on the wick for evaporation of the liquid; and (5) the ability, during manufacture, of the wick to be directly inserted into the fitment/liquid reservoir system following the downward direction.

15 However, currently available wick fitments do not incorporate various of these advantageous design characteristics. Moreover, many prior art wick fitments do not effectively prevent access to the fragrance liquid in the fragrance liquid reservoir by the consumer. Accordingly, a wick fitment and wick exhibiting the design characteristics would be advantageous.

20

### SUMMARY OF THE INVENTION

The present invention relates generally to the fastening of a fluid transport mechanism to a fluid reservoir, and optionally, to various mechanisms which increase the effectiveness of the vaporizing units within which such devices may be employed. For example, in  
25 accordance with various aspects of one embodiment of the present invention the fluid transport mechanism is suitably fastened to the reservoir and removal of the transport mechanism is substantially inhibited by a retaining force provided by one or more fastening features. That is, in accordance with various aspects of the present invention, the transport mechanism is fabricated or suitably augmented such that once it has been inserted into the  
30 reservoir, it is not easily removable without significant force or through the use of tools.

The retaining force is a force which opposes other forces applied to the transport mechanism which would tend to remove the fluid transport mechanism. For example, in accordance with various exemplary aspects of the present invention, the retaining force is provided, at least in part, by fastening features configured on the fluid transport mechanism

and/or other components, such as a fitment or a sleeve, which engages the transport mechanism and likewise inhibits its removal by directing the retaining force in a direction opposite to that which is needed to remove the transport mechanism from the reservoir. Thus, in accordance with various aspects of the present invention, the fastening elements may  
5 suitably comprise various configurations of the transport mechanism itself, components attached to or part of the reservoir, or various combinations of the forgoing, all of which provide an effective retaining force which aids in inhibiting removal of the transport mechanism.

In accordance with various other aspects of the present invention, various other  
10 advantages are provided which either enhance effectiveness of delivery or other performance features.

#### BRIEF DESCRIPTION OF THE DRAWING

A more complete understanding of the present invention may be derived by referring  
15 to the detailed description and claims when considered in connection with the drawing figures, where like reference numbers refer to similar elements throughout the figures, and:

FIGS. 1A-1F illustrate various fluid transport mechanisms and fluid reservoirs in accordance with various aspects of the present invention wherein a wick device in accordance with various embodiments of the present invention is provided with various retention  
20 features;

FIGS. 2A-2F illustrate various fluid transport mechanisms and fluid reservoir in accordance with various alternative aspects of the present invention;

FIG. 3 is a side view of a wick fitment device in accordance with an exemplary embodiment of the present invention;

25 FIG. 4 is a cross-sectional view of a wick fitment device in accordance with an alternative embodiment of the present invention;

FIG. 5 is a side view of a wick fitment device in accordance with a further alternative embodiment of the present invention;

30 FIG. 6 is a cross-sectional side view of a wick fitment device in accordance with an other exemplary embodiment of the present invention; and

FIG. 7 is a cross-sectional diagram of a portion of a wick fitment device in accordance with yet another embodiment of the present invention.

### DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

The following descriptions are of exemplary embodiments of the invention only, and are not intended to limit the scope, applicability or configuration of the invention in any way. Rather, the following description is intended to provide convenient illustrations for  
5 implementing various embodiments of the invention. As will become apparent, various changes may be made in the function and arrangement of the elements described in these embodiments without departing from the scope of the present invention.

That being said, the present invention relates generally to the fastening of a fluid transport mechanism to a fluid reservoir, and optionally, to various mechanisms which  
10 increase the effectiveness of the vaporizing units within which such devices may be employed. For example, as described in additional detail below, the fluid transport mechanism is suitably fastened to the reservoir such that removal of the transport mechanism is substantially inhibited by a retaining force provided by one or more fastening features. Stated otherwise, in accordance with various aspects of the present invention, the transport  
15 mechanism is fabricated or suitably augmented such that once inserted into the reservoir, it is not easily removable without significant force or the use of tools.

Thus, generally speaking, preferably the retaining force is suitably selected to comprise a force which opposes other forces applied to the transport mechanism which would tend to remove the mechanism. For example, as will be described in additional detail below,  
20 in accordance with various exemplary aspects of the present invention, the retaining force is provided, at least in part, by fastening features such as a flange configured on the transport mechanism which engages the reservoir to inhibit removal of the transport mechanism by directing the retaining force in the opposite direction of that needed to remove the transport mechanism. Similarly, in accordance with various alternate aspects of the present invention,  
25 the retaining force may be provided by fastening features comprised of other components, such as a fitment or a sleeve, which engages the transport mechanism and likewise inhibits its removal by directing the retaining force in a direction opposite to that needed to remove the transport mechanism from the reservoir. In this regard, it should be apparent that any number of fastening features which provide the retaining force for inhibiting the removal of the  
30 transport mechanism fall within the scope of the present invention.

In general, as described in greater detail below, in accordance with various aspects of the present invention, the fastening elements may suitably comprise various configurations of the transport mechanism itself, components attached to or part of the reservoir, or various

combinations of the forgoing, all of which provide the retaining force which helps inhibit the removal of the transport mechanism.

However, preliminarily and generally speaking, various liquid vaporizers are known and the inventive transport mechanism are suitable for use in any number of such dispensers. That is, any liquid dispensing device which facilitates the transfer of a liquid through a fluid transfer mechanism (e.g., a wick) can feasibly incorporate various aspects of the present invention. For example, a typical non-limiting example used herein is an electric liquid vaporizer comprising a housing unit configured to receive a liquid container or bottle portion. In such systems, typically, the bottle portion includes some type of a wick or wick system which permits the liquid, which is ultimately to be vaporized (in some fashion), to be absorbed therein through capillary action. The housing unit of such a system may contain a heating mechanism, typically electrically activated. The bottle portion which generally contains the liquid for vaporization, is usually configured for attachment to the housing unit such that the wick is suitably positioned proximate the heating mechanism, if employed, so that the liquid will be vaporized.

Exemplary devices suitable for incorporating the present invention include vaporizing devices such as liquid electric air fresheners like those described in U.S. Patent No. 6,104,867 issued August 15, 2000 to Stathakis et al; U.S. Patent No. 5,647,053 issued July 8, 1997 to Schroeder et al; and U.S. Patent No. 5,038,394 issued August 6, 1991 to Hasegawa et al. though, generally speaking, various aspects of the present invention can be incorporated in any number of devices, now known or as yet unknown in the art, designed for transporting fluid through a wick or other similar mechanism, and air freshening devices are merely non-limiting examples.

Similarly, the vaporizable material can be any number of conventional materials dispensed from vapor dispensers including fragrances, disinfectants, sanitizing agents, insect repellants, insecticides and the like. For exemplary purposes, herein the liquid is often referred to as fragrance dispensed from an air freshening device.

In accordance with various aspects of the present invention, for example, with respect to liquid air fresheners, the wick serves as the fluid transport mechanism and transports the liquid to be vaporized from the reservoir to the liquid dispensing area. Exemplary transport/wick materials include any material which may be suitably configured to exhibit acceptable porosity. Moreover, some wick materials such as, for example, polymeric wick materials, graphite, paper, fibers and others are adaptable to be configured in accordance with the present invention to have various dimensions and shapes that allow for a variety of

structure, such as fastening elements, and functions, and optionally, with aesthetic surface design features. That is, another advantage of wicks in accordance with various aspects of the present invention over the prior art, is their ability to be molded into a variety of shapes.

For example, in accordance with various aspects of the present invention and as  
5 mentioned above, the wick may be configured with fastening elements in the form of any number of shapes which provide a retaining force for inhibiting removal of the wick from the reservoir. In accordance with various aspects of the present invention, fastening elements suitably comprise structure (including the wick material itself) which act to engage the reservoir during attempted removal and direct the retaining force in the opposite direction of  
10 that needed to remove the transport mechanism.

That being said, as mentioned above, the wick and fastening elements suitably can exhibit any number of a myriad of shapes. Various different configurations are illustrated in the several drawing figures. In all instances, the configurations illustrated include a wick 100, a reservoir 102 and optionally various attachments or other features of wick 100 which  
15 facilitate and/or assist in providing various of the advantages of the present invention.

For example, FIGS. 1A-1F and 2A-2F illustrate various non-limiting examples of fastening elements configured, generally, from the wick material itself. As mentioned above, in accordance with various embodiments of the present invention, a wick 100 and a bottle 102 are provided. Wick 100 is suitably configured with a fastening element 104. Generally,  
20 in many of these illustrative embodiments, fastening element 104 comprises a portion of wick 100 that is larger than an opening (or neck) 108 on bottle 102 from which wick 100 protrudes for delivery of the fragrance. Preferably, wick 100 comprises material pliable enough then when larger portion is inserted into opening 108, portion sufficiently contracts to fit through opening 108, yet after passing through opening 108, portion sufficiently expands back to a  
25 diameter larger than opening 108, such that when attempts are made to remove wick 100, an upper surface 110 of portion engages an inside, upper surface 112 of bottle, thereby providing the retaining force for inhibiting removal of wick 100. Alternatively, in some cases, assembly may be accomplished by inserting wick 100 into opening 108 from the underside such that portion 106 suitably prevents further introduction, while at the same time also  
30 inhibiting removal of wick 100 during use.

Many configurations which incorporate various differently configured larger portions 106 discussed above are possible. Moreover, the fastening features of the various figures should be self-evident. Nonetheless, for illustrative purposes, certain figures are described in more detail. For example, FIG. 1A depicts a polymer wick 100, in accordance with the

present invention, having lower portion 106 with a substantially greater diameter than that of neck 108. Alternatively, FIG. 1B shows a wedge-like configuration for lower portion 106 of wick 100. In still another embodiment, FIG. 2A shows wick 100 incorporating portion 106 as a disk-like annular ring positioned approximately in the center of wick 100. Preferably, 5 annular ring 106 is sized so as to fit snugly into bottom surface 112 and neck 108 and prevent easy removal of wick 100 from bottle 102. In the wick configuration shown in FIG. 2B, a disk-like annular ring similar to that of the wick in FIG. 2A is positioned at the center of wick 100, such that wick 100 itself is symmetrical about its center. The symmetrical configuration of wick 100 offers an advantage during assembly of the vapor-dispensing device, in that it 10 avoids the need for wick sorting prior to the insertion of wick 100 into bottle 102.

Thus, in general, any configuration of portion 106 which suitably provides a retaining force for inhibiting removal of wick 100 may be employed. The exemplary embodiments are intended as illustrative only; other configurations may be employed without departing from the scope of the present invention.

15 In accordance with additional and/or alternative aspects of the present invention, the fastening elements may include an upper portion 114 in addition to or alternative to larger lower portion 106. Upper portion 114 suitably assists in maintaining wick 100 in bottle 102. For example, in accordance with one aspect of this embodiment of the present invention, FIG. 1C shows wick 100 with respective wedges 106, 114 which engage opposite sides of 20 neck 108. Such an arrangement thus provides a retaining force for maintaining wick 100 in bottle 102. Additionally, such engagement can provide additional stability of wick 100 after insertion. Moreover, the wick of FIG. 1C is symmetrical about any axis perpendicular to the principal axis of the wick; this being a generally advantageous design feature for avoiding alignment and orientation issues in the manufacturing process.

25 Referring now to FIG. 1D, a substantially horizontal annular connection 104 element is suitably interposed between neck 108 of bottle 102 and the exposed surface of the wick. In this configuration, an additional annular connecting element 111 is preferably interposed above annular connection 104 aid in providing a suitable retention force. Various other ring, ring like or other configurations may be used in accordance with certain aspects of the 30 present invention to suitably fasten wick 100 to bottle 102. For example, as briefly mentioned above, fastening elements in accordance with the present invention may comprise, alternatively or additionally, various components distinct from the wick, which suitably provide the retaining force for inhibiting removal of the wick. Similar to the discussion above relating to wick configurations, component fastening elements provide the retaining



force which acts in a direction opposite to that which tends to remove the wick from the bottle. For example, with momentary reference to FIG. 1E suitable rib-like retention members generally biased in a substantially opposite direction to that of wick insertion to prevent or otherwise inhibit retraction of wick 100 from bottle 102. Alternatively, as shown  
5 in FIG. 1F a unitary wick fitment element 113 can be secured to the reservoir-neck through the use of other configurations. Thus, it should be apparent that many configurations of wick 100 having a lower portion larger than neck are possible for providing the retaining force.

From the description this far provided, it should be appreciated that, in accordance with various aspects of the present invention, a number of component configurations can  
10 provide a suitable retaining force. Non-limiting examples include a wick fitment apparatus such as an extended sleeve area in which the wick is inserted, various locking structures adapted to engage the wick and/or liquid reservoir. It should be appreciated that any number of components such as these, now known or as yet devised, which suitably provide the retaining force, fall within the scope of the present invention.

15 That being said, in accordance with one exemplary embodiment of the present invention, fastening features comprise an extended sleeve for engaging the wick and inhibiting its removal. In various embodiments, extended sleeve is a separate component which is snap fit to the bottle, though in various alternative embodiments, extended sleeve can be integrated with bottle as one unit.

20 Extended sleeve retains the wick by an improved friction fit. With monetary reference to, for example, FIGS. 2C-2F, such an extended sleeve can be used with various wick configuration and employed in various manners. In each case the extended sleeve is similarly depicted. While prior art solutions recognize the use of "press fitting" wicks into bottle wicks, and typically use the friction created to aid in wick retention, they are generally  
25 less effective at wick retention. In contrast, in accordance with one aspect of a preferred embodiment of the invention, the ratio of the wick diameter to the diameter of the extended sleeve portion and/or the length of the extended sleeve portion is selected such that insertion of the wick into the fitment apparatus is facilitated during the assembly process, while a satisfactory wick retention force is maintained. This obtains, at least, in part, due to the  
30 extended nature of the sleeve which permits functional engagement of a significant portion of the wick. With monetary reference to FIG. 3 sleeve 200 preferably includes a major portion 202, bonded by respective upper and lower portions 204 and 206 which together cooperate to attach to sleeve to the reservoir (e.g. bottle) (not shown). In a typical embodiment, such elements enable the sleeve to be snap-fit on to the bottle. Sleeve 200 may include a conically

shaped region 208 which communicates with a generally cylindrical region 210. Together regions 208 and 210 enable receipt of a wick material (not shown in FIG. 3, but see, for example FIG. 2E).

In certain applications, the conically shaped region may admit of various advantages, including, *inter alia* provision of a collection reservoir for liquid, enhanced surface area of the which material, and others.

Referring now to monetarily FIG. 4, certain applications may be desirable to configure the lower portion 210 in a tapered manner. That is in accordance with various aspects of another embodiment of the present invention, the extended sleeve portion of the wick fitment apparatus is tapered, such that the diameter of an upper portion 212 of the extended sleeve is greater than a diameter of the lower portion 214 of the extended sleeve.

As illustrated in FIGS. 3 and 4, a wick fitment fastening feature in accordance with various embodiments of the present invention, comprises an extended sleeve 200. In this embodiment, extended sleeve 200 is a component for providing retaining force which is distinct from bottle 102 (not shown) and/or any wick configurations which include fastening features. However, as mentioned above and as will be described further herein, extended sleeve 200 (or other components) can be integrated with bottle 102 and/or other portions of the liquid dispenser and/or act in conjunction with other aspects of the present invention which provide retaining forces.

That being said, in this embodiment, sleeve 200 comprises lower portion 210 which extends downward into bottle 102. Lower portion 210 secures the wick in proper orientation and alignment within the liquid fragrance container and provides the retaining force for inhibiting removal. In accordance with one aspect of a preferred embodiment of the present invention, the ratio of the wick diameter to the fitment sleeve diameter is specified such that wick insertion into the wick fitment is facilitated during device assembly, but also such that the wick retention force is sufficient to prohibit easy wick removal from the assembled vapor-dispensing device. Preferably, the ratio of the wick diameter to the fitment sleeve diameter is in the range of about 0.80 to about 1.10; more preferably from about 0.90 to about 1.00; and most preferably from about 0.94 to about 0.98.

30

#### EXAMPLE 1

In the tests of fastening features, particularly extended sleeves in accordance with the present invention, enhanced extraction forces (corresponding to enhanced retaining forces) were observed. Particularly, in these tests, wicks having diameters of about 7.1 mm and 7.3 mm were placed in short fitment devices of the prior art and extended sleeves in accordance

with the present invention. The results of these tests are shown in Table 1

TABLE 1

	Extended Sleeve	Prior Art Fitments	Extended Sleeve	Prior Art Fitments
Wick Diameter	7.3 mm	7.3 mm	7.1 mm	7.1 mm
Maximum Extraction Force (kg.f)	10.6	6.5	9.6	5.8
	11.1	6.4	7.9	3.5
	8.6	6.7	11.7	3.6
	12.8	5.4	11.9	3.1
	12.1	5.6	9.4	3.1
	11.4	3.4	6.0	3.4
Average	11.1	5.7	9.4	3.8

In a series of six tests removing the wicks, in each of the tests, the maximum extraction force for extended sleeves was larger than that for the prior art sleeves, signifying enhanced retaining force. Notably, in several of the tests, for wicks of about 7.3 mm, in prior art fitments, the extraction force ranged from about 3.4 to about 6.7 kg-f, and averaged about 5.7 kg-f. In contrast, tests of wicks of about 7.3 mm in extended sleeves of the present invention resulted in extraction forces ranging from about 8.6 to about 12.8 kg-f, and averaged about 11.1 kg-f. Similarly, for wicks of about 7.1 mm, in prior art fitments, the extraction force ranged from about 3.1 to about 5.8 kg-f, and averaged about 3.8 kg-f. Again, in contrast, tests of wicks of about 7.3 mm in extended sleeves of the present invention resulted in better performance. Particularly, the extraction forces ranged from about 6.0 to about 11.9 kg-f, and averaged about 9.4 kg-f. Thus, the order of magnitude of the increased retaining force for extended sleeves in accordance with the present invention was two to three times more and average extraction force for the wick samples in the extended sleeve nearly doubled.

Additionally, it should be appreciated that many other configurations of components, sleeves, fitments and the like, as well as configurations of the wick material itself and combinations, various other wick configurations, such as are illustrated in the several other

drawing figures, for example, as shown in, for example FIGS. 5-7, may be used either alone or in combination with other attachments.

Referring now to FIG. 5, a sleeve 200 in accordance with one embodiment of the present invention includes a locking mechanism 220 to secure wick fitment and wick onto the neck portion of the liquid fragrance reservoir, thus preventing easy access to the contents of the reservoir by the consumer. Referring now to FIG. 6, a sleeve 200 in accordance with one embodiment of the present invention includes a sealing ring mechanism 230 on the upper portion of sleeve 200. Sealing ring mechanism 230 preferably mates with one or more matching rings on the overcap device to prevent leakage of liquid fragrance from under the cap during transport and storage of the vapor-dispensing device.

With reference now to FIGS. 6 and 7, a further exemplary fitment is illustrated. Sleeve 200 suitably includes a conical well 240 in the upper portion of the fitment. Conical well 240 is preferably adapted to contain any liquid that may seep from the wick in the vapor-dispensing device. Moreover, conical well 240 is preferably shaped and sized accordingly to provide additional surface area for wick exposure to enhance evaporation—and thus fragrance release—of the liquid fragrance in the vapor-dispensing device. Preferably, conical well 240 is further shaped and sized accordingly to facilitate insertion of the wick during the manufacturing process. The shape of conical well 240 may vary according to the particular design of the vapor-dispensing device, the shape of the wick, and the limitations of the manufacturing specifications and the device assembly process. Generally, however, conical well 240 is shaped such that the diameter of the upper portion of the well (*i.e.*, the portion adjacent sealing ring 230) is greater than the diameter of the lower portion of the well (*i.e.*, the portion adjacent locking mechanism 220).

As shown in FIG. 6, but in greater detail in FIG. 7, sleeve 200 is suitably configured to engage bottle in a secure manner. Preferably the portions of fitment, as shown, are suitably dimensioned to secure fitment to the bottle (not shown) and provide enhanced structural competence.

Particular advantages have been recognized, however, by utilizing porous polymer wicks in connection with various embodiments of the present invention, such as those described in U.S. Patent Application Serial No. \_\_\_\_\_, entitled "Porous Polymer Wick for Vapor-Dispenser," filed October 9, 2001, the contents of which are incorporated by reference herein. Other wick materials that may be utilized in connection with various aspects of the present invention, depending upon the desired utility of the vapor-dispensing device, include porous/sintered plastics such as ultra high density polyethylene

and polypropylene, bonded fibers such as polyesters and polypropylene, glass-sintered fibers, porous ceramic, carbon fiber, sintered carbon, graphite, wood, compressed wood composites, bundled or woven natural fibers such as cotton, linen, bundled or woven synthetic fibers such as nylon, polypropylene, polyethylene, polyesters, polyamides, rayon, polyacetates, and the  
5 like.

Various alternative wick designs, such as have been variously illustrated and/or described herein, may include features, for example, such as those shown in FIGS. 2A-2F, which can be effectively used to prevent or impede the wick material from being removed from the fragrance liquid reservoir thereby inhibiting liquid spill, leakage, and access. In  
10 addition, such various designs permit wick insertion into the wick fitment from the downward direction with the fragrance liquid reservoir pre-filled. FIG. 2C illustrates a wick configuration including a disk-like annular ring positioned at the center of the wick. Additionally, a middle portion of the wick of FIG. 2C preferably has a greater diameter than the end portions of the wick. Preferably, the middle portion of the wick having the greater  
15 diameter is sized so as to snugly fit into the wick fitment sleeve portion, which tends to enhance the wick retention force and prevent access to the liquid in the reservoir after wick insertion. As with the wick of FIG. 2B, this wick configuration is preferably symmetrical about the center of the wick, so as to avoid the need for wick sorting during assembly of the vapor-dispensing device. FIG. 2D illustrates a wick configuration similar to that of FIG. 2C,  
20 except that the enhanced-diameter middle portion of the wick has a tapered or elliptical configuration, rather than the substantially cylindrical configuration shown in FIG. 2C. FIGS. 2E and 2F illustrate wicks having configurations identical to those in FIGS. 2C and 2D, except that the disk-like annular ring is eliminated. Preferably, wicks configured according to FIGS. 2E and 2F have enhanced-diameter middle portions sized so as to achieve  
25 sufficient wick retention force in the wick fitment and prevent spillage, leakage, or access to the fragrance liquid in the reservoir.

Additionally, the fastening mechanisms in accordance with the present invention preferably have little or no affect on the overall effectiveness of the device, for example, the rate at which fluid is transported through the wick of an air freshening device, into which the  
30 fastening mechanisms are incorporated,

Various principles of the invention have been described in illustrative embodiments. However, many combinations and modifications of the above-described structures, arrangements, proportions, elements, materials and components, used in the practice of the invention, in addition to those not specifically described, may be varied and particularly

adapted to specific environments and operating requirements without departing from those principles.

5

## CLAIMS

We claim:

1. An apparatus for fastening a fluid transport mechanism to a container comprising  
a fluid transport receiving mechanism configured for attachment to a container and  
for receipt of the fluid transport mechanism, and  
a fluid transport mechanism including a first part and second part, said first part  
extending upwardly from said receiving mechanism and said second part extending  
downwardly from said receiving mechanism, said second part including an enlarged portion.
2. The apparatus of claim 1 wherein said second part enlarged portion is configured to provide  
an effective retaining force which opposes other forces applied to aid fluid transport mechanism which would  
tend to remove said fluid transport mechanism from said receiving mechanism.
3. The apparatus of claim 2 wherein said second enlarged part substantially inhibits removal of  
said fluid transport mechanism from said receiving mechanism.
4. The apparatus of claim 2 wherein said first part of said fluid transport mechanism evidences a  
first geometric configuration and wherein said second enlarged part evidences a geometric configuration which  
is different from said first geometric configuration.
5. The apparatus of claim 4 wherein said first geometric configuration is substantially  
cylindrical.
6. An improved air treatment device of the type having a bottle for containing an air treatment  
material and a wick in at least partial fluid communication with said air treatment material, improved wherein,  
said wick includes an enlarged portion which substantially inhibits removal of said wick from said bottle.
7. The air treatment device of claim 6 further comprising a connection device for receiving said  
wick, said connection device configured for attachment to said bottle.
8. The air treatment device of claim 7 wherein said wick enlarged portion substantially prevents  
removal of said wick from said connection device.
9. A wick system comprising  
a fluid reservoir;  
a wick;  
a wick fastening device for fastening said wick to said fluid reservoir;  
wherein said wick includes a fastening feature to securely attach said wick to said fastening device,  
said fastening feature comprising a portion of said wick.
10. The wick system of claim 9 wherein said wick fastening feature comprises at least one  
enlarged portion being formed in or on said wick.
11. The wick system of claim 10 wherein said wick fastening feature comprises at least of a first  
and a second enlarged portion, each of said first and second portions being formed in or on said wick.
12. The wick system of claim 11 wherein said wick is attached to said wick fastening device such  
that said first portion is positioned above said fastening device and said second portion is positioned below said  
fastening device.
13. The wick system of claim 10 wherein said at least one enlarged portion is positioned below  
said wick fastening device when said wick is attached to said wick fastening device and said wick fastening

device is attached to said fluid reservoir.

14. The wick system of claim 9 wherein said wick fastening device comprises a first portion for attachment to said fluid reservoir and a second portion for receipt of said wick.

15. The wick system of claim 14 wherein said second portion includes an extended sleeve and  
5 said first portion in proximity to said second portion includes a conically shaped reservoir.



1/5

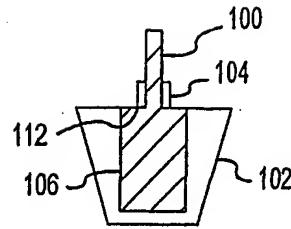


FIG. 1A

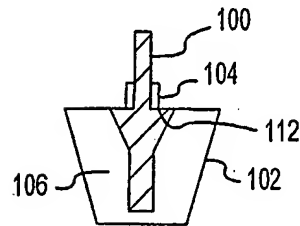


FIG. 1B

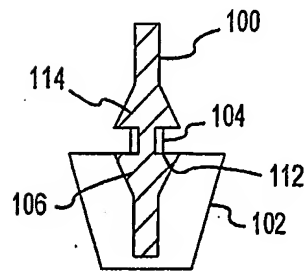


FIG. 1C

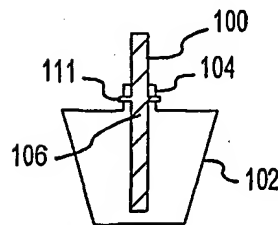


FIG. 1D

2/5

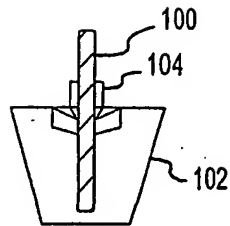


FIG. 1E

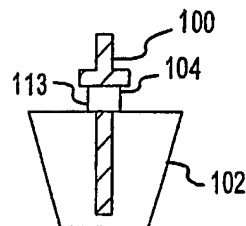


FIG. 1F

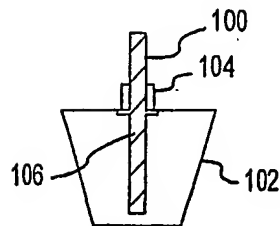


FIG. 2A

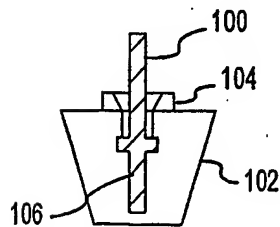


FIG. 2B

3/5

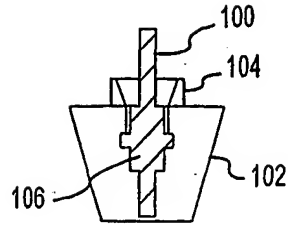


FIG. 2C

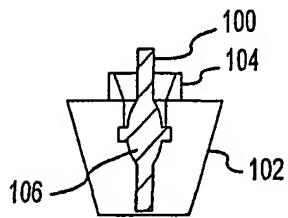


FIG. 2D

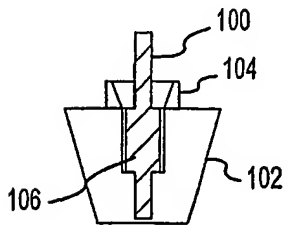


FIG. 2E

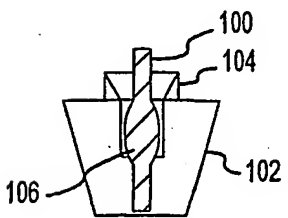


FIG. 2F

4/5

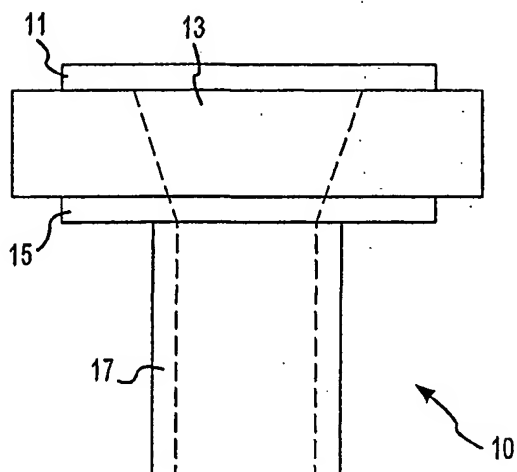


FIG.3

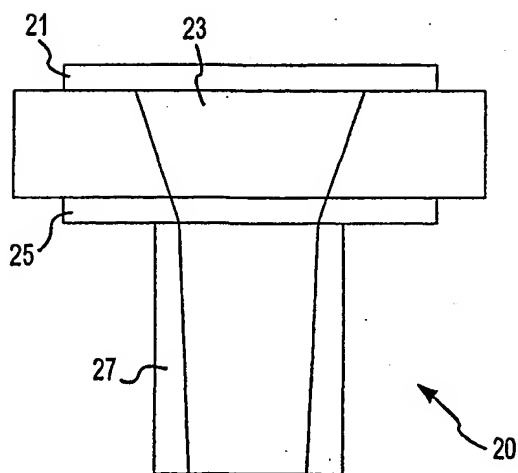


FIG.4

5/5

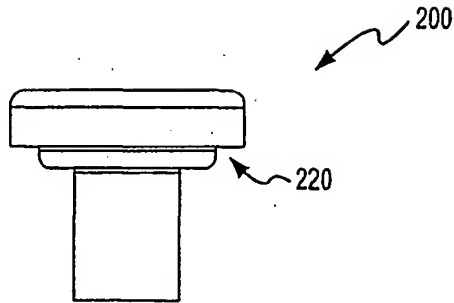


FIG. 5

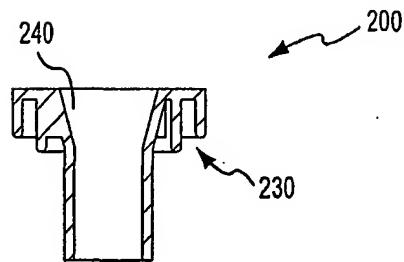


FIG. 6

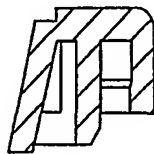


FIG. 7